

High Severity of Illness Patients in a Small Metropolitan Area

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Abstract

This study evaluated the impact of high severity of illness patients on hospital utilization in the metropolitan area of Syracuse, New York between 2012 and 2015. It employed the All Patients Refined Severity of Illness system developed by 3M™ Health Information Systems. These patients are important for the management and practice of nursing in acute hospitals. The study demonstrated that patients at extreme and major severity of illness generated 60 - 70 percent of the inpatient days for adult medicine and adult surgery in the combined Syracuse hospitals. Mean lengths of stay for patients at extreme severity of illness were two to four times the stays for these services. Inpatient readmission rates for extreme severity of illness patients were more than double the rates for these services. The study data also indicated that the impact of patients at high severity of illness was increasing over time. The study also demonstrated that recent efforts of the Syracuse hospitals have produced reductions in the numbers of excess patient days for adult medicine and surgery, but limited reductions in the mean lengths of stay for these patients. The data suggested that meeting the needs of these patients is especially challenging in a small metropolitan area without an additional level of care within the continuum.

Keywords

Hospitals, Severity of Illness, Hospital Lengths of Stay, Hospital Readmissions

1. Introduction

In the United States, purchasers and providers of health care continue to focus on improving efficiency and quality of care. The aging of populations and the impact of chronic diseases have placed demands on the availa-

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bility of payer resources and challenged providers to reduce expenses and improve outcomes [1] [2].

A major challenge to these efforts has been the group of patients at high severity of illness. This population includes individuals with multiple chronic diseases such as circulatory, respiratory, digestive, renal, and mental health disorders. Because of the aging of local populations resulting from advances in medical care and other factors, it is no longer unusual for individuals to experience a number of these conditions [3] [4].

With respect to health services, these patients frequently require large amounts of care. As a result, they are sometimes known as superutilizers. In many communities, this care is focused in acute hospitals because nursing homes, home health agencies, and physician offices lack the capability to manage them. This is especially an issue in small metropolitan areas which lack availability of post hospital services on a 24 hour/7 day basis [5]-[7].

These patients are important for the management and practice of nursing in acute hospitals. The planning and management of their care must be addressed by hospital staff on a continuous basis.

Many of these high severity of illness patients are challenging to health care services because of issues related to efficiency and outcomes. They generate lengthy hospital stays. Some of these stays are related to inpatient complications that entail large hospital expenses for nursing care, testing, and pharmaceuticals. Some of these patients are also associated with multiple readmissions. In many respects, these high severity of illness patients are the embodiment of the connection between health care expenses and outcomes [8]-[11].

For all of these reasons, addressing the needs of patients with high severity of illness has become a major interest for payers and providers of care. The high resource consumption experienced by these patients has made them major financial risks for new forms of payment such as Accountable Care Organizations. The heightened risk of long inpatient stays, multiple readmissions, and inpatient complications also creates major challenges for providers of care [12].

The need for effective management of these patients may be greatest outside major metropolitan areas. In smaller communities, where there are few alternative services to meet their needs, the impact of this population falls disproportionately on hospitals.

2. Population

This study evaluated the impact of hospital patients with high severity of illness in the metropolitan area of Syracuse, New York. This area includes three acute care facilities, Crouse Hospital (19,776 discharges excluding well newborns, 2015), St. Joseph's Hospital Health Center (24,803 discharges, 2015), and Upstate University Hospital (28,237 discharges, 2015). Within the health care system of Onondaga County, the Syracuse hospitals work with a combined medical staff of 1,830 physicians and 12 nursing homes.

These hospitals provide primary and secondary acute care services to a small metropolitan area with a population of approximately 600,000. They also provide tertiary services to an eleven county region with a population of approximately 1,400,000 [13].

Historically, the Syracuse hospitals have worked cooperatively to improve the efficiency and outcomes of care in cooperation with their joint planning organization, the Hospital Executive Council. These initiatives have included efforts to improve care for patients with high severity of illness [14].

These efforts have included reduction of hospital stays, monitoring of readmissions, and reduction of inpatient complications. The programs have employed the All Patients Refined Diagnosis Related Group Severity of Illness system, as well as the Potentially Preventable Readmissions and Potentially Preventable Complications software [15] [16].

These programs have focused on hospital inpatient utilization and outcomes, which is of major interest to nursing within the acute care facilities. Because inpatient hospital nursing is a 24 hour/7 day activity, most topics related to utilization and outcomes are directly related to this professional area.

3. Methods

This study evaluated the impact of high severity of illness patients on the hospitals of Syracuse, New York during a four year period, from 2012 to 2015. It focused on indicators of utilization and outcomes including inpatient discharges, lengths of stay, readmissions, and complications.

Within the study, this population was defined as patients at Major and Extreme Severity of Illness according to the All Patients Refined Diagnosis Related Groups developed by 3M™ Health Information Systems. The specific structure of the algorithm is the property of 3M™ Health Information Systems. This algorithm is based

on clinical and demographic factors including principal and secondary diagnoses, operating room procedures, and age of each patient. The principal and secondary diagnoses are especially important. All of this information is available in administrative data abstracted from patient medical records [17].

The study focused on these populations within the adult medicine and adult surgery inpatient services of the Syracuse hospitals. Between 2012 and 2015, these services accounted for more than 70 percent of inpatient discharges for the three hospitals combined. They have also included a substantial majority of inpatient hospital services in the United States.

The initial component of the study focused on basic indicators of hospital utilization, including numbers of inpatient discharges and patient days, by severity of illness. These data were aggregated for the combined Syracuse hospitals for 2012, 2013, 2014, and 2015. The study data were obtained from the hospitals of Syracuse, New York by the Hospital Executive Council. The Council provides management for the collection of data and the development of community wide studies of this type through business associate agreements with each of the hospitals.

The study analysis was based on administrative data. The data were processed using the 3M™ Health Information Systems All Patients Refined Severity of Illness system and basic spreadsheet programs.

Evaluation of the data in this component of the analysis focused on proportions of total discharges and patient days that were at Extreme and Major severity of illness. It also included changes in volumes for total adult medicine and surgery patients and for patients at high severity of illness, during this interval.

The second component of the study focused on lengths of stay and excess patient days for adult medicine and adult surgery patients in the Syracuse hospitals by severity of illness. This analysis also included evaluation of differences in stays by severity of illness and changes in stays during the four year period.

In this analysis, excess patient days were based on the differences between lengths of stay for the combined Syracuse hospitals and stays for a national sample of patients with the same distribution by severity of illness. For stays related to individual severity of illness categories, comparisons involved patients in one or more levels of severity, such as Extreme and Major. This approach effectively controlled for the impact of differences in the severity of illness of patients on inpatient stays.

The comparisons of lengths of stay and excess patient days evaluated, in part, the impact of the Difficult to Place and Complex Care Programs implemented by the Syracuse hospitals through the Hospital Executive Council. The Difficult to Place Program, initiated in 1998, focused on reduction of stays for patients discharged to nursing homes, the inpatient population with the longest stays.

The Complex Care Program was implemented early in 2015. It involved the development of services in nursing homes for patients with high severity of illness through a partnership among the long term care facilities, the Syracuse hospitals, and the Hospital Executive Council. The population included patients who required multiple intravenous antibiotics, extensive wound care, and one to one behavioral health services. The partnership included the distribution of Program Development Funds by the hospitals to support these services in the nursing homes.

The third component of the study focused on hospital inpatient readmissions for adult medicine and adult surgery patients in the Syracuse hospitals. It employed the Potentially Preventable Readmissions software developed by 3M™ Health information Systems to evaluate this outcomes indicator between 2012 and 2015.

Data elements for this component of the study included numbers of readmissions and readmission rates for each service. The impact of high severity of illness patients on volumes of readmissions and readmission rates were evaluated during the most recent year and during the four year period.

4. Results

The initial component of the analysis focused on indicators of hospital utilization with respect to inpatient volumes. Relevant data concerning adult medicine and adult surgery for the Syracuse hospitals are summarized in [Table 1](#).

This information demonstrated that patients with high severity of illness consumed large amounts of resources, indicated by inpatient days and discharges for these services. In 2015, adult medicine patients at Major and Extreme severity were responsible for 68.5 percent of the inpatient days and 51.9 percent of the discharges. For adult surgery, they generated 61.3 percent of the patient days and 27.8 percent of the discharges. These data reflected the larger amounts of hospital inpatient care expended on these patients through nursing, pharmaceuticals, and tests.

Table 1. Inpatient adult medicine and adult surgery discharges and patient days by severity of illness, Syracuse Hospitals, 2012-2015.

	Number of Discharges				Patient Days			
	2012	2013	2014	2015	2012	2013	2014	2015
Adult Medicine								
Extreme	3858	4122	4159	4335	42,699	43,903	46,973	46,750
Major	13,010	13,078	12,836	13,095	75,930	76,238	76,895	75,042
Moderate	13,188	12,212	11,976	11,906	48,966	45,429	45,873	44,563
Minor	5,222	4653	4450	4216	13,640	11,877	12,326	11,366
Total	35,278	34,065	33,421	33,552	181,235	177,447	182,067	177,721
Adult Surgery								
Extreme	1385	1541	1440	1834	34,637	35,247	35,007	44,785
Major	3778	3988	4007	4063	35,960	35,507	36,590	36,390
Moderate	8061	8202	8551	8717	33,347	32,798	34,530	33,953
Minor	7206	6723	6562	6607	19,457	17,899	18,110	17,361
Total	20,430	20,454	20,560	21,221	123,401	121,451	124,237	132,489

Adult medicine data exclude Diagnosis Related Groups concerning surgery, obstetrics, pediatrics, psychiatry, alcohol/substance abuse treatment, rehabilitation, and all patients aged 0 - 17 years. Adult surgery data exclude Diagnosis Related Groups concerning medicine, obstetrics, pediatrics, psychiatry, alcohol/substance abuse treatment, and all patients aged 0 - 17 years. Source: Hospital Executive Council.

This information also demonstrated that, for both services in the Syracuse hospitals, total inpatient volumes changed slightly between 2012 and 2015 while utilization for high severity of illness patients increased. The larger increases for high severity of illness patients suggested a shift in the volume of inpatient care toward these individuals.

For adult medicine, total discharges declined by 4.9 percent, from 35,278 to 33,552 during the four year period. At the same time, discharges for patients at Extreme severity of illness increased by 12.4 percent, from 3858 to 4335, and discharges for patients at Major and Extreme severity of illness combined increased by 3.3 percent, from 16,868 to 17,430. These developments may also have reflected the impact of a payer reclassification of medical observation patients, which caused the volume of lower severity of illness discharges to decline between 2013 and 2014.

For adult surgery, changes in the volume data were similar. Total discharges increased slightly, by 3.9 percent, from 20,430 to 21,221. Discharges for patients at Extreme severity of illness increased 32.4 percent, from 1385 to 1834, and discharges for patients at Major and Extreme severity of illness combined increased by 14.2 percent, from 5163 to 5897.

For adult medicine, total inpatient days declined during the four year period by 1.9 percent, from 181,235 to 177,721. Within this interval, days for patients at Extreme severity of illness increased by 9.5 percent, from 42,699 to 46,750, and days for patients at Major and Extreme severity of illness combined increased by 2.7 percent, from 118,629 to 121,792.

For adult surgery, total inpatient days increased by 7.4 percent, from 123,401 to 132,489. At the same time, patient days for Extreme severity of illness increased by 29.3 percent, from 34,637 to 44,785, and days for patients at Major and Extreme severity of illness combined increased by 15.0 percent, from 70,597 to 81,175.

The second component of the study focused on hospital lengths of stay and excess patient days in the combined Syracuse hospitals between 2012 and 2015. Relevant data are summarized in [Table 2](#).

These data demonstrated that, for both services, mean lengths of stay were considerably longer for high severity of illness patients than for those at Minor and Moderate severity. The stays for patients at Extreme severity of illness were more than twice the total stays for adult medicine and almost four times the total stay for adult surgery.

Table 2. Inpatient adult medicine and adult surgery lengths of stay by severity of illness, Syracuse Hospitals, 2012-2015.

	Mean Lengths of Stay				Excess Patient Days			
	2012	2013	2014	2015	2012	2013	2014	2015
Adult Medicine								
Extreme	11.07	10.65	11.29	10.78	1543.20	0.00	2703.35	303.45
Major	5.84	5.83	5.99	5.73	2211.70	2092.48	3722.44	785.70
Moderate	3.71	3.72	3.83	3.74	923.16	610.60	1317.36	357.18
Minor	2.61	2.55	2.77	2.70	52.22	-372.24	400.50	126.48
Total	5.14	5.21	5.45	5.30	4938.92	2384.55	8355.25	1667.60
Adult Surgery								
Extreme	25.01	22.87	24.31	24.42	6426.40	3328.56	5385.60	165.06
Major	9.52	8.90	9.13	8.96	2342.36	119.64	520.91	1218.90
Moderate	4.14	4.00	4.04	3.90	-1289.76	-2132.52	-2394.28	-784.53
Minor	2.70	2.66	2.76	2.63	-1513.26	-1546.29	-1509.26	-594.63
Total	6.04	5.94	6.04	6.24	5924.70	-204.54	1850.40	-212.21

Adult medicine data exclude Diagnosis Related Groups concerning surgery, obstetrics, pediatrics, psychiatry, alcohol/substance abuse treatment, rehabilitation, and all patients aged 0 - 17 years. Adult surgery data exclude Diagnosis Related Groups concerning medicine, obstetrics, pediatrics, psychiatry, alcohol/substance abuse treatment, and all patients aged 0 - 17 years. Source: Hospital Executive Council.

With respect to adult medicine, this information demonstrated that the mean total length of stay for the combined hospitals increased by 3.5 percent, from 5.14 to 5.30 days, between 2012 and 2015. During this interval, the length of stay for patients at extreme severity of illness declined by 2.6 percent, from 11.07 to 10.78 days, and the stay for patients at Major severity of illness declined by 1.9 percent, from 5.84 to 5.73 days. It was notable that most of the declines in stays for patients at Major and Extreme severity of illness occurred between 2014 and 2015.

The data also demonstrated a substantial reduction in the number of total excess patient days for this service, from 4938 to 1667, between 2012 and 2015. Consistent with the length of stay data, a substantial part of this reduction involved patients at Extreme and Major severity of illness and occurred between 2014 and 2015.

With respect to adult surgery, this information demonstrated that the mean total length of stay for the combined hospitals increased by 3.3 percent, from 6.04 to 6.24 days, during the four year period. Within this interval, the mean length of stay for patients at Extreme severity of illness declined by 2.3 percent, from 25.01 to 24.42 days, and the stay for patients at Major severity of illness declined by 5.9 percent, from 9.52 to 8.96 days.

As in the case of adult medicine, the adult surgery data also demonstrated a decline in the number of excess days, from 5924 to -212, between 2012 and 2015. This reduction was generated by shorter stays for patients at Extreme and Major severity of illness.

The third component of the study focused on inpatient readmissions for adult medicine and adult surgery patients combined in the combined Syracuse hospitals between 2012 and 2015. Relevant data are summarized in **Table 3**.

These data demonstrated that inpatient readmission rates for the combined Syracuse hospitals were considerably higher for patients at Major and Extreme severity of illness than for the total population. The rates for Extreme severity of illness were 2 - 3 times the total rates and the rates for Extreme and Major severity of illness combined were double those of the adult medical-surgical population.

The readmission data also demonstrated that rates increased by severity of illness. Within every year and for each hospital, rates for Moderate severity of illness were higher than those for Minor severity, rates for Major were higher than those for Moderate, and rates for Extreme severity were higher than rates for Major.

As in the volume data, readmission rates by severity of illness increased over time. Between 2012 and 2015, total rates for the combined hospitals increased by 28.4 percent, while rates for Extreme severity of illness increased by 42.0 percent and rates for Extreme and Major severity of illness combined increased by 23.9 percent.

Table 3. Inpatient adult medical-surgical readmissions by severity of illness, Syracuse Hospitals, 2012-2015.

Severity of Illness	Number of Readmissions				Readmission Rates			
	2012	2013	2014	2015	2012	2013	2014	2015
Extreme	510	642	631	879	16.09	16.18	18.60	22.85
Major	1605	1871	1680	2254	12.17	12.30	12.73	16.43
Moderate	1235	1260	1189	1338	7.23	6.84	7.00	7.73
Minor	427	408	418	366	3.98	3.84	4.43	3.98
Total	3777	4181	3918	4837	8.55	8.67	9.11	10.98

Source: Hospital Executive Council.

5. Discussion

This study evaluated the impact of patients at high severity of illness on hospital utilization in a small metropolitan area. It included four years of data concerning utilization and outcomes for adult medicine and surgery in the combined hospitals of Syracuse, New York. These patients are high utilizers of nursing services within acute hospitals.

The study demonstrated that patients at Extreme and Major severity of illness accounted for between 60 and 70 percent of inpatient days for the two services. Mean lengths of stay for patients at Extreme severity of illness were twice the total stay for adult medicine patients and more than four times those of the total stay for adult surgery patients. Inpatient readmission rates for Extreme severity of illness were more than double the total rate for adult medical-surgical patients.

The study data also indicated that the impact of patients at high severity of illness on the major hospital services was increasing over time. Between 2012 and 2015, total patient days generated by Major and Extreme severity of illness patients increased by 2.7 percent for adult medicine and by 15.0 percent for adult surgery. For patients at Extreme severity of illness, patient days increased by 9.5 percent for adult medicine and 29.3 percent for adult surgery.

This information suggested that patients at high severity of illness accounted for a major proportion of health care in the Syracuse hospitals. The significant proportions of patient days for the two major services demonstrated that these patients were consuming larger amounts of nursing hours, pharmaceuticals, and testing.

If the experience of the Syracuse hospitals is typical of others, high severity of illness patients are dominating the utilization of acute care providers. By implication, they may also be dominating the expenses of many health care payors, especially Medicare and Medicaid. As low severity of illness patients are shifted to outpatient settings, the extent of this influence will increase.

The study data indicated that recent efforts of the Syracuse hospitals to address the increasing impact of high severity of illness patients have achieved mixed results. Programs to address inpatient stays for this population produced large reductions in numbers of excess patient days between 2014 and 2015. These results reflected the impact of the Complex Care Programs that were implemented in 2015.

At the same time, the mean lengths for high severity of illness patients declined by only 2 - 3 percent for adult medicine patients and 0 - 7 percent for adult surgery patients. These results suggested the impact of the programs on the actual stays and related consumption of health care resources was limited.

This information suggested that meeting the needs of high severity of illness patients while improving the efficiency and outcomes of care are especially challenging in a small metropolitan area. In the Syracuse hospitals, the impact of efforts to reduce inpatient stays and readmissions were constrained by the absence of another level of care within the continuum. The Subacute and Complex Care Programs have comprised an effort to provide the level of care that high severity of illness patients require on a 24 hour/7 day basis, however, they were developed and funded by the hospitals.

The study also could contribute to more extensive utilization of data concerning patients with high severity of illness. As interest in this topic increases, publication of additional data concerning this subject will be useful.

6. Conclusions

All of this information suggests that the care of individuals at high severity of illness is an important community concern. These patients are among the most disadvantaged members of local populations. They need and deserve to have access to settings of care beyond acute hospitals. Without that access, they will consume increasing amounts of the capacity of hospitals.

In small health care systems, the needs of this population can be especially challenging. Without access to another level of long term acute care, high severity of illness patients will remain in hospitals and occupy larger amounts of resources. Eventually, this development could reduce the availability of hospital inpatient and emergency department services for the rest of the community as well. In this context, some of the efforts required to evaluate and address this concern need to come from hospitals as they have in Syracuse, however, some of them need to come from the rest of local health care systems and the communities that depend on them.

References

- [1] Dentzler, S. (2011) Urgent Measures for an Old Problem. *Health Affairs*, **30**, 1626. <http://dx.doi.org/10.1377/hlthaff.2011.0961>
- [2] Kellermann, A.D.L. (2011) A Decade of Health Care Cost Growth Has Wiped out Real Income Gains for an Average U.S. Family. *Health Affairs*, **30**, 1630-1636. <http://dx.doi.org/10.1377/hlthaff.2011.0585>
- [3] Gawande, A.A. (2011) The Hot Spotters: Can We Lower Costs by Getting the Neediest Patients Better Care? 24 January 2011, New Yorker.
- [4] Johnson, T.L., Rinehart, D.J., Durfee, J., Brewer, D., Batal, H., Blum, J., Oronce, C.J. and Melinkovich, P. (2015) For Many Patients Who Use Large Amounts of Health Care Services; The Need Is Intense Yet Temporary. *Health Affairs*, **34**, 1312-1323. <http://dx.doi.org/10.1377/hlthaff.2014.1186>
- [5] Hong, C.S., Siegel, A.L. and Ferris, T.G. (2014) Caring for High Need, High Cost Patients: What Makes for a Successful Care Management Program? Commonwealth Fund, New York.
- [6] Hasselman, D. (2013) Super Utilizer Summit: Common Themes for Innovative Complex Care Management. Center for Health Care Strategies, Princeton.
- [7] Lagoe, R., Pernisi, L. and Littau, S. (2015) The Impact of Severity of Illness at the Community Level. *Open Journal of Nursing*, **5**, 1102-1109. <http://dx.doi.org/10.4236/ojn.2015.512117>
- [8] Skinner, J., Chandra, A., Goodman, D. and Fisher, E.S. (2009) The Elusive Connection Between Health Care Spending and Quality. *Health Affairs*, **28**, 1256-1258. <http://dx.doi.org/10.1377/hlthaff.28.1.w119>
- [9] Fuller, R.L., McCullough, E.C., Bao, M.Z. and Averill, R.F. (2009) Estimating the Costs of Potentially Preventable Complications. *Health Care Financing Review*, **30**, 17-32.
- [10] Weil, A.R. (2015) Hospital Costs and Quality. *Health Affairs*, **34**, 1263. <http://dx.doi.org/10.1377/hlthaff.2015.0786>
- [11] Weil, A.R. (2016) High Cost Populations, the ACA, and More. *Health Affairs*, **35**, 7. <http://dx.doi.org/10.1377/hlthaff.2015.1562>
- [12] Fisher, E.S., Shortell, S.M., Kriendler, S.A., Van Citters, A.D. and Larson, B.K. (2012) A Framework for Evaluating the Formation and Implementation of Accountable Care Organizations. *Health Affairs*, **31**, 2368-2378. <http://dx.doi.org/10.1377/hlthaff.2012.0544>
- [13] Lagoe, R.J., Pasinski, T., Kronenberg, P., Quinn, T. and Schaengold, P. (2006) Linking Health Services at the Community Level. *Canada Healthcare Quarterly*, **9**, 60-65. <http://dx.doi.org/10.12927/hcq..18229>
- [14] Lagoe, R. and Lagoe, R. (2014) Tracking the Sustainability of Improvements in Hospital Outcomes. *Advances in Bioscience and Biotechnology*, **5**, 895-902. <http://dx.doi.org/10.4236/abb.2014.511104>
- [15] Goldfield, N.J., McCullough, E.C., Hughes, J.S., Tang, A.M., Eastman, B., Rawlins, L.K. and Averill, R.F. (2008) Identifying Potentially Preventable Readmissions. *Health Care Financing Review*, **30**, 75-92.
- [16] Hughes, J.S., Averill, R.F. and Goldfield, N.J. (2006) Identifying Potentially Preventable Complications Using a Present on Admissions Indicator. *Health Care Financing Review*, **27**, 63-82.
- [17] 3M Health Information Systems (1998) All Patients Refined Diagnosis Related Groups (APR DRGs). 3M Health Information Systems, Wallingford.